

SD 431.5

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TIMBER MANAGEMENT PLAN

HOLY CROSS WORKING CIRCLE

White River National Forest

Colorado

Region 2

July 1, 1962 - June 30, 1972



REGION TWO

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

TIMBER MANAGEMENT PLAN

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Colorado
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July 1, 1962 - June 30, 1972

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	<i>See White River Plan</i>

This map illustrates the distribution of National Forests and Land Utilization Areas across Colorado. The state is divided into counties, with major rivers and cities marked. National Forests are highlighted in green, and Land Utilization Areas are shown in yellow. The map includes labels for various land management zones, such as Routt, Larimer, Roosevelt, Arapaho, and Gunnison. Major rivers like the Colorado, Grand, and Arkansas are depicted. The map also shows the locations of major cities like Denver, Fort Collins, and Colorado Springs. The map is titled "NATIONAL FORESTS AND LAND UTILIZATION AREAS IN COLORADO" and is published by the GPO.



Holy Cross W. C.

SUMMARY OF PLAN

Table 1

Annual Allowable Cut From Regulated Types

Type	Area Acres	Volume	
		Cubic Feet	Board Feet Scribner Dec. C
		M C.F.	MM B.F.
Lodgepole Pine	1,500	4,060	10
Spruce-Fir			
Sawtimber	2,000	6,400	24
Salvable Dead	1,000	3,600	-
Total	5,380	14,060	34

Allowable Cut Volume By Species

Species	Lodgepole Pine Sawtimber M B.F.	Spruce- Fir Sawtimber M B.F.	Total Sawtimber M B.F.	Lodgepole Pine Poletimber Cords	Dead Spruce Cords
Engelmann Spruce, live:	1,300	18,000	19,300	100	3,400
Engelmann Spruce, dead:	-				31,400
Lodgepole Pine	8,000	1,000	9,000	7,300	1,300
Subalpine Fir	700	5,000	5,700	400	6,500
Douglas-fir	-	-	-	100	-
Total Conifers	10,000	24,000	34,000	7,900	42,600
Aspen	-	1,000	1,000	1,100	400
Grand Total	10,000	25,000	35,000	9,000	43,000

Table 2

Total Area and Volume in Unregulated Types

Type	Area M Acres	Volume
Douglas-fir Sawtimber	19	96,700 M B.F.
Aspen Poletimber	194	1,080 M Cords

Table 3

Area Summary By Land Classification, Ownership
and Stand Size Class

		Thousand Acres				
Land Classification and Stand Size Class		Ownership				
		: National : Forest	: Other: : Federal:	: State	: Private	: Total
Commercial Forest Land	:	:	:	:	:	:
Sawtimber	:	277	:	:	16	293
Poletimber	:	330	:	:	28	358
Seedling-Sapling	:	35	:	:	4	39
Nonstocked	:	12	:	:	-	12
Unclassified	:	31	:	:	-	31
Total	:	685	-	1	48	734
Noncommercial	:	194	:	-	20	214
Non-forest	:	273	:	-	28	301
Total	:	1,152	-	1	96	1,249
Reserved	:	:	:	:	:	:
Productive	:	13	:	:	:	13
Nonproductive	:	21	:	:	:	21
Non-forest	:	60	2	:	:	62
Total	:	94	2	-	-	96
Grand Total	:	1,246	2	1	96	1,345

Table 4

Area of National Forest Commercial Forest Land
By Types, Stand Size and Stocking Classes

Thousand Acres

Type	Stand Size and Stocking Classes															Total	Per- cent
	Small Sawtimber				Poletimber				Seedling-Sapling				Non-	Un-			
	Well	Med.	Poor	Total	Well	Med.	Poor	Total	Well	Med.	Poor	Total	stocked	classified			
Douglas-fir	-	5	14	19	4	6	4	14	-	-	-	-	-	-	33	05	
Lodgepole Pine	-	28	48	76	45	20	6	71	1	-	-	1	-	-	148	22	
Spruce-Fir	5	95	81	181	5	28	20	53	-	1	5	6	12	-	252	37	
Dead Spruce				-				-				-	-	31	31	04	
Total Conifers	5	128	143	276	54	54	30	138	1	1	5	7	12	31	464	68	
Hardwoods				1				192				28	1	-	222	32	
Grand Total				277				330				35	13	31	686		
Percent				40				48				5	02	05	100	100	

Table 5

Total Volume For Commercial Forest Lands
By Ownership and Species Group

Species Group and Ownership	Cubic Feet		Board Feet : Trees 11.0"+ D.B.H.	
	Trees : 5.0-10.9" : D.B.H.	Trees : 11.0"+ D.B.H.	Int. : 1/4"	Scribner : Dec. C
	MM C.F.	MM C.F.	MM B.F.	MM B.F.
Softwood Types	:	:	:	:
National Forest	: 464	: 697	: 3,000	: 2,565
Private	: 18	: 29	: 156	: 133
Total	: 482	: 726	: 3,156	: 2,698
Hardwood Types	:	:	:	:
National Forest	: 56	: 37	:	:
Private	: 7	: 5	:	:
Total	: 63	: 42	: -	: -
Grand Total	:	:	:	:
National Forest	: 520	: 734	: 3,000	: 2,565
Private	: 25	: 34	: 156	: 133
Total	: 545	: 768	: 3,156	: 2,698

Table 6

Total Volume of Sawtimber By Species
In Sawtimber Types

National Forest Unreserved Lands

Sawtimber Types	M B.F. By Species (Scribner Decimal C)							Total
	Douglas- fir	Ponderosa Pine	Lodgepole Pine	Subalpine Fir	Engelmann Spruce	Aspen		
Douglas-fir	83,504	6,893	1,976	1,577	3,281	127		97,358
Lodgepole Pine	1,194		531,755	43,837	84,558	1,857		663,201
Spruce-Fir	8,808		89,472	462,661	1,668,456	88,545		2,317,942
Aspen	68			1,475		6,917		8,460
Total	93,574	6,893	623,203	509,559	1,756,295	97,446		3,086,961

Table 7

Periodic Annual Net Growth Based on Past 10 Years
For Trees 5.0" D.B.H. and Larger

Type	Cubic Feet Per Acre	Total for Type
Lodgepole Pine		
Sawtimber	+ 8.42	639 M C.F.
Poletimber	+12.77	911 M C.F.
Spruce-Fir		
Sawtimber	+16.11	2,920 M C.F.

Table 8

Recommended Rotation and Adjustment Period

Type	Adjustment Period	Rotation
Lodgepole Pine	50 years	80 years
Spruce-Fir	100 years	140 years

Revision Date

This plan will be revised by June 30, 1972. Revision may be made prior to this date if necessary because of changed conditions.

TIMBER MANAGEMENT PLAN

HOLY CROSS WORKING CIRCLE

White River National Forest

INTRODUCTION

This working circle plan is a 10-year action program. The action prescribed is needed to meet the long term objectives in the General Timber Management Statement for the White River National Forest.

The plan will be revised by no later than June 30, 1972. Earlier revisions may be made if necessary to meet changing conditions. Detailed Forest Survey data, from which this plan was formulated, are on the IBM sheets labeled "1958 Forest Survey, Colorado, IBM Sheets, White River National Forest, Sample Unit 29." They are bound and filed in the forest supervisor's office at Glenwood Springs, Colorado.

Compartment records containing maps, volumes, type areas and compartment descriptions are filed in the timber management atlas of this working circle. These records will be kept current annually for action taken within the compartments. The current actions recorded are -- area and volume cut, both regulated and unregulated; stand improvement work done; losses from fire, etc.; and changes in ownership. This action will be recorded in graphic and tabular form.

The working circle records will be maintained in the offices of the district rangers concerned.

SUMMARY OF RESULTS UNDER PREVIOUS PLANS

This plan combines the old Crystal River, Eagle River, Frying Pan and Roaring Fork Working Circles into the Holy Cross Working Circle.

Harvesting

For the period F.Y. 1952-1961, the total allowable cut was 202,300 M B.F. and the actual cut was 65,723 M B.F. The product was largely spruce and lodgepole pine sawtimber. The annual allowable cut from 1951-1956 was 27,850 M B.F. In 1957 this was changed to 8,800 M B.F. to reflect losses caused by the Engelmann spruce beetle epidemic of the 1940's and early 1950's, and to serve until the forest survey was completed and plans revised. The allowable cut was not attained, principally because of a lack of demand from industry, due largely to an insufficient road system.

Timber Stand Improvement

During the past 10 years in lodgepole pine stands, noncommercial thinning was done on some 700 acres and dwarfmistletoe control work was done on 400 acres.

Reforestation

Planting consisted of some 362 acres of spruce and lodgepole pine. Seeding was limited to 25 acres. The reforestation, in general, during the past 10-year period was considered successful.

Insect Control

The major portion of the Engelmann spruce insect control program of the early 1950's was conducted in this working circle. A total of 23,600 acres were treated by spraying individual trees with orthodichlorobenzene and ethylenedibromide. Some 920,000 trees were treated. In addition, 2,000 trap trees were felled by the Forest Service and 3,000 by timber operators. Small mop-up jobs using trap trees were continued through 1958. Since that time, all insect infestations have been kept within an endemic level.

Fire Control

Fires have not been a destructive element to the commercial forest lands during the past 10 years. Protection limited the area of commercial forest land burned over to 85 acres out of some 686,000 acres.

The following shows the total number of fires for the 10 years by major timber types.

Timber Types	: Number of Fires	: Total Acres Burned
Spruce-Fir	:	:
Live Stands	: 68	: 12
Dead Spruce	: 0	: 0
Lodgepole Pine	: 50	: 65
Douglas-fir	: 4	: 8
Total Commercial Forest Land	: 122	: 85
Other Lands	: 90	: 207
Total	: 212	: 292

Of the above fires 90 percent were man-caused.

MANAGEMENT OBJECTIVES

The long range objective of this plan is to attain the sustained yield capacity of the working circle. The immediate 10-year objective is to make all practicable progress toward attaining optimum growing conditions on commercial timber areas and to provide for protecting these areas from such destructive agents as fire, disease and insects. To accomplish this objective, the following must be done during this planning period.

1. Work with the adjacent forests and the Regional Office towards getting a fiber-utilizing industry, for example, a pulp mill, established on the Colorado River, adjacent to this working circle. Such an industry is needed to fully utilize the lodgepole pine and spruce-fir types, including the salvable insect-killed spruce on some 31,000 acres.
2. Attain the allowable cut of sawtimber by F.Y. 1972. This will mean tripling the present cut of live timber and can only be accomplished by introducing more sawmill operations.
3. Establish a reforestation program to --
 - (a) Reforest 4,000 acres of nonstocked spruce-fir type and fill-in plant 1,700 acres of understocked spruce-fir and subalpine fir seedling-sapling stands during this 10-year period.
 - (b) Assure adequate stocking within three to five years after cutting on all current cutover areas in accordance with Region 2's Timber Management Guides.
4. Control dwarfmistletoe on lodgepole pine cutover areas. This will amount to 10 percent of the cutover area, or about 550 acres.
5. Prepare and activate a detailed plan to re-establish coniferous stands on 18,000 acres of aspen type.
6. Maintain proper stocking in lodgepole pine stands by weeding and thinning in accordance with regional instructions.
7. Keep commercial forest land fire damage within the annual PAR established in the forest's fire prevention plan.

8. Prevent epidemic outbreaks of destructive forest insects. This will be done principally through a good detection program around both cut and uncut areas and by preventive action required in timber sale contracts.
9. Salvage as much of the insect-killed Engelmann spruce as possible and restore good growing conditions on the cutover areas. The dead spruce is suitable for the production of pulp and if not excessively checked, is suitable for both round and squared mine timbers.
10. Salvage all merchantable blowdown material currently through sales.

REGULATION

Regulation will be by area, with the allowable cut expressed in both area and volume. Control will be by 10-year periods. Undercuts that have built up during the period may be cut during the remainder of the same period, provided that the total cumulative cut does not exceed the allowable periodic cut by more than 10 percent. The control of the allowable cut will be by type area and not by species or products cut within the type. Sales programs will be by species and products and will be in volumes sufficient to meet area control objectives. Sales programs will normally exceed allowable cut objectives; otherwise the average annual cut will fall short of meeting the 10-year objective. Emphasis will be placed on increasing the current actual cut until experience shows the allowable cut objectives are assured.

The financed cut for any one year is based upon volume and includes the cut from both the regulated and unregulated areas. The financial cut quota should be sufficient to meet both volume and area objectives for the forest as a whole.

If the present relationship between area and volume is found to be out of proportion for the forest as a whole, the volume allowable cut will be adjusted to be consistent with area regulation. No adjustment, however, will be made prior to the end of the first five-year period.

Demands for wood products from the working circle have been limited largely to Engelmann spruce and lodgepole pine sawtimber. At the present time there is no market for the insect-killed spruce, aspen and poletimber-size lodgepole pine. It is expected that markets will be developed during this planning period for "dead spruce" and poletimber-size lodgepole pine.

The harvesting of the following types will be regulated --

Spruce-fir, including salvable dead spruce, and lodgepole pine.

Allowable cuts will not be established for aspen until a market has been developed for the species.

The Douglas-fir type is considered largely inoperable at this time. The type occurs on steep, rocky slopes. The quality of the sawtimber-size trees is very poor due to the excessive number of limbs.

Adjustment Periods and Rotations

Previous plans used a rotation period of 160 years for calculating the allowable cut. This plan uses a 50-year period for lodgepole pine and 100 years for spruce-fir for converting wild stands to managed stands. This will make it possible to put the working circle in good growing condition by the year 2000 A.D.

Rotation periods of 140 years for spruce-fir and 80 years for lodgepole pine are used in this plan for using the Kemp formula. The rotation period for the spruce-fir type is the same as used on adjoining working circles.

The rotation for lodgepole pine is based on pulpwood-size material. It is assumed that a pulpwood industry will be established adjacent to the working circle some time prior to the end of the adjustment period. An 80-year rotation will permit a sustained yield cut of pulpwood with no reductions after the 50-year adjustment period.

Method of Cutting

Region 2's Management Guide for Engelmann Spruce and Associated Species, FSH2-2442.8, will be applied in designating timber for harvesting. These guides provide for clear cutting by patches, strips or groups with even-age management as the objective.

Timber management within roadsides, recreation areas, streamsidess and waterfronts will be for the purpose of protecting, improving, and maintaining stands of timber that will be adequate for the use to be made of the areas.

Timber cutting within established recreation areas will be in accordance with the objectives set up in the recreation plan for the specific area.

It is essential that a good timber management job be done in order to maintain good aesthetics in areas used by the general public. A complete slash disposal job will be accomplished immediately after logging in the special treatment areas. This may be by piling and burning, chipping, or other approved methods.

The Regional Forester and Forest Supervisor are authorized to make sales within their authorizations within the roadside zones of system roads, including Highways U.S. 6 and 24, ~~for the purpose of protecting, improving, and maintaining stands of timber.~~

Growing Stock

The forest inventory divides the spruce-fir, lodgepole pine, and Douglas-fir types into stand size and stocking classes. For the aspen type only stand size classes are used. There is no breakdown within classes for the "dead spruce" type. The stock and stand tables give a description of what is in each type delineation.

The definitions for the various classes are Forest Survey standards in effect at the time of the inventory.

Stand Size Classes

Sawtimber - Stands that have an average net volume per acre of 1,500 board feet (International $\frac{1}{4}$ " log scale) or more in trees 11.0" and larger d.b.h.

Poletimber - Stands failing to meet sawtimber specifications, but at least 10 percent stocked with poletimber-size trees and larger (5.0" + d.b.h.). The plurality of cubic foot volume is in trees 5.0" - 10.9" d.b.h.

Seedling-Sapling - Stands that do not qualify as either poletimber or sawtimber stands, but are at least 10 percent stocked with commercial species 1.0" - 4.9" d.b.h.

Nonstocked - Stands that do not meet any of the above qualifications, i.e., normally less than 10 percent stocked.

Tree Size Classes

Sawtimber - Trees 11.0" + d.b.h.

Poletimber - Trees 5.0" - 10.9" d.b.h.

Seedling-Sapling - Trees 1.0" - 4.9" d.b.h.

Sawtimber inventory volumes as used in this plan are in trees 9.0"+ d.b.h. in the sawtimber type.

Stocking class or crown density class refers to the extent to which growing space is utilized by present growing stock trees of commercial species. The classification is based on the percent of crown closure. The stocking classes for sawtimber stands as used in this plan are for the percent of closure of sawtimber crowns. The stocking classes for poletimber and seedling-sapling stands are based on crown closure for all trees, regardless of their size.

<u>Classification</u>	<u>Percent of Crown Closure</u>
Nonstocked	0 to 9
Poorly Stocked	10 to 39
Medium Stocked	40 to 69
Well Stocked	70+

Condition classes were not used in the survey. The breakdown into stand size classes is purely on size and does not reflect the growing potential of the trees into the next larger size class. For example, the areas of overstocked lodgepole pine poletimber were typed as poletimber. The growth potential of these stands is questionable due to age and stocking. Even if the stocking is reduced, it is questionable if growth could be accelerated.

The operability factor was obtained by estimating the percent of the stands that could be economically harvested during the planning period. The cost of roads in relation to the volume of timber is the determining factor. Some of the stands will not be operable until all-purpose road funds make such stands accessible.

Table 9

Distribution of Stand Size Classes For
The Regulated Types

Stand Size Classes	Lodgepole Pine			Spruce-Fir		
	Area	Operability		Area	Operability	
	M Acres	Percent	Factor	M Acres	Percent	Factor
Sawtimber	76	51	.75	181	64	.65
Poletimber	71	48		53	19	
Seedling-Saplings	1	01		6	02	
Nonstocked	-			12	04	
Unclassified	-			*31	11	.75
Total	148	100		283	100	

*Dead spruce type.

Table 10

Distribution of Stand Size Classes
For The Nonregulated Types

Stand Size Classes	Douglas-fir		Aspen	
	Area		Area	
	M Acres	Percent	M Acres	Percent
Sawtimber	19	58	1	-
Poletimber	14	42	193	87
Seedling-Saplings	-	-	28	13
Nonstocked	-	-	-	-
Total	33	100	222	100

Growth and Mortality

The periodic annual net growth for the major types is summarized in Table 11. This was calculated from Table NFA 31 on file in the Forest Survey IBM binder in the supervisor's office.

Mortality has been due largely to bark beetle. During the 1940's and early 1950's some 31,000 acres of spruce was killed by the spruce bark beetle. Since that time there have been limited scattered outbreaks.

Empirical yield tables are not available. Growth under managed conditions can be expected to increase at least twice that of the current growth in the spruce-fir type.

The Forest Survey plots will be re-examined at the end of this planning period. The length of the adjustment period may be changed if there is any unusual increase in mortality in the sawtimber types.

Table 11

Adjusted Current Average Annual Growth and Mortality Per Acre
By Major Types

(From Table NFA 31 in IBM Binder)

Major Types	Gross Growth		Mortality		Net Growth	
	Bd. Ft.	Cu. Ft.	Bd.Ft.	Cu. Ft.	Bd.Ft.	Cu. Ft.
Douglas-fir Sawtimber	11.92	3.31	2.87	1.05	+ 9.05	+ 2.26
Lodgepole Pine Sawtimber	54.64	14.30	19.53	5.88	+35.11	+ 8.42
Spruce-Fir Sawtimber	125.87	30.81	49.73	14.70	+76.14	+16.11
Lodgepole Pine Poletimber	19.78	13.92	3.72	1.15	+16.06	+12.77
Aspen Poletimber	14.60	5.81	3.79	0.53	+10.81	+ 5.28

Calculation of Allowable Cut

Lodgepole Pine Type

Fifty-one percent of the lodgepole pine type is of sawtimber size. The average age of trees 9.0"-10.9" d.b.h. is 85 years, while the average age of trees 13.0-14.9" d.b.h. is 150 years. Considering the poor growth, 35 board feet per acre per year, and the general age, an adjustment period of 50 years is used to convert this type from a wild to a managed stand.

Forty-eight percent of the type is of poletimber size. Twenty percent of the poletimber stand size class is over 70 years of age and should be clear cut and regenerated during the 50-year adjustment period.

Some 70,000 acres of lodgepole pine is scheduled for cutting during the next 50 years. This is the net area after applying a 75 percent operability factor.

The 70,000 acres is composed of 56,000 acres typed as sawtimber-size stands and 14,000 typed as poletimber-size stands. The present 25 percent inoperability is due to the lack of an adequate transportation system. Some of the patches of timber lack sufficient volume to write off a road system. These areas cannot be harvested until "all-purpose" roads become available. This percent of inoperability should decrease with each successive planning period.

Table 12 gives an allowable cut for the first 10-year period for the lodgepole pine type as follows --

Area - 15,000 acres

Volume - 40,600,000 cubic feet

This is based on a tabulation method of calculation.

The cubic foot allowable cut converted to board feet for the 10-year period, based on 80 percent of the cubic foot volume coming from sawtimber size stands is --

Scribner Decimal C = 32,500 M C.F. x 3.07 = 100 MM B.F.

International $\frac{1}{4}$ " = 32,500 M C.F. x 3.76 = 122 MM B.F.

A comparison of the allowable cut given by the tabulation method with other area calculations is as follows --

Kemp formula

$$\frac{76,000 \times 7 + 71,000 \times 5 + 1,000 \times 3}{4 \times 80} = \frac{890,000}{320} = 2,781 \times 75\% \text{ operability} = 2,000 \text{ acres}$$

$$2,000 \text{ acres} \times 2,720 \text{ cu.ft.} = 5,440 \text{ M C.F. per year.}$$

Straight area -- Total area divided by rotation.

$$\frac{148,000 \text{ acres}}{80 \text{ yrs.}} = 1,850 \text{ acres per year.}$$

$$1,850 \text{ acres} \times 2,720 \text{ cu.ft.} = 5,032 \text{ M C.F. per year.}$$

The allowable cut calculated by the above formulas indicates that there should be no reductions in cut at the end of the 50-year adjustment period. The 4,060 M C.F. volume allowable cut divided into species is as follows --

Species	: Cubic Feet : M C.F.	: Board Feet : M B.F.
Lodgepole Pine	: 3,126	: 8,000
Subalpine Fir	: 365	: 700
Engelmann Spruce	: 529	: 1,300
Total Conifers	: 4,020	: 10,000
Aspen	: 40	: -
Grand Total	: 4,060	: 10,000

Spruce-Fir Type

Table 9 shows the distribution of stand size classes in the spruce-fir type. There are 181,000 acres of sawtimber-size stands. The periodic annual net growth is 76 board feet per acre.

It is estimated that only about 65 percent of the type is operable. The sawtimber type is in scattered blocks. There is no large concentration in any one part of the working circle. This makes roads costly. Some of the timber stands do not have sufficient volumes to depreciate the road costs. These stands cannot be harvested until they are made accessible by all-purpose roads.

A 100-year converting period will be used to calculate the allowable cut. Present stand conditions indicate this is feasible. The cost of constructing a forest road system also makes a long converting period desirable.

If there is appreciable change in mortality during this planning period, the converting period may be adjusted at the next revision of this plan.

Table 12 shows the periodic allowable cut for the spruce-fir type as based on a tabulation method. This for the 10-year period is --

Area - 20,000 acres
Volume - 64,000 M C.F.

The cubic foot allowable cut converted to board feet is --

Scribner Decimal C = 64,000 M C.F. x 4.04 = 25 MM B.F.

International $\frac{1}{4}$ " = 64,000 M C.F. x 4.77 = 30 MM B.F.

A comparison of the allowable cut as based on the tabulation method with other area calculations is as follows --

Kemp formula

$$\frac{181,000 \times 7 + 53,000 \times 5 + 31,000 \times 3 + 18,000}{4 \times 140} = \frac{1,643,000}{560} = 2,900$$

2,900 acres x 65% operability = 1,900 acres per year.

1,900 acres x 3,248 cu. ft. = 6 MM C.F. or 24 MM B.F.

Straight Area - Total area divided by rotation.

$$\frac{283,000}{140} = 2,000 \text{ acres} \times 65\% \text{ operability} = 1,300 \text{ acres.}$$

1,300 acres x 3,248 cu. ft. = 4 MM C.F.

The foregoing formulas indicate that if an adequate road system is constructed during the adjustment period, there should be no reduction in volume available for cutting at the end of the adjustment period.

Insect-killed Spruce Stands

There are 31,000 acres of insect-killed spruce stands in the working circle. It is estimated that 75 percent of this area is operable. Eighty percent of the area is stocked with seedling-saplings, largely subalpine fir. The remaining 20 percent is nonstocked.

It is questionable if the dead spruce will remain salvable for a period of more than 25 years.

The regulated cut is based on a 25-year salvage period. This will not be considered as a limitation but as a guide as to how much must be cut to get over the area during the 25 years. The exact period, of course, will be open to negotiation at the time a market develops for the material.

Calculation of Annual Cut --

$$31,000 \text{ acres} \times 75\% = 23,250 \text{ acres.}$$

$$\frac{23,250}{25} = 930 \text{ acres per year, or rounded off to 1,000 acres per year.}$$

There is an average of 2,661 cubic feet of dead spruce and 984 cubic feet of green timber per acre.

The volume allowable cut is --

$$1,000 \text{ acres} \times 3,645 \text{ cu. ft.} = 3,645 \text{ M C.F., or 43 M cords.}$$

The volume allowable cut for the spruce-fir type broken down by species is --

Species	:From Sawtimber :Stand Size Type	:From Unclassified Stand :Size Type (Dead Spruce)
	: M B.F.	: Cords
Engelmann Spruce, Live :	18,000	: 3,400
Engelmann Spruce, Dead :	-	: 31,400
Subalpine Fir, Live :	5,000	: 6,500
Lodgepole Pine, Live :	1,000	: 1,300
Total Conifers :	24,000	: 42,600
Aspen :	1,000	: 400
	:	:
Grand Total :	25,000	: 43,000

Table 12

Allowable Cut

By Area and Cubic Foot Volume
For Each 10-Year Period

10- Year Period:	Type	Area To Be Cut :M Acres	Volume Per Acre			Total Volume For Period : M C.F.
			Beginning: of Period : C.F.	Net Growth : C.F.	Total : C.F.	
1st	:Lodgepole Pine	: 15.0	: 2,675	: 45	: 2,720	: 40,600
	:Spruce-Fir					
	: Sawtimber(SF9)	: 20.0	: 3,168	: 80	: 3,248	: 64,000
2nd	:Lodgepole Pine	: 14.5	: 2,765	: 45	: 2,810	: 40,600
	:Spruce-Fir					
	: Sawtimber	: 19.0	: 3,328	: 80	: 3,408	: 64,000
3rd	:Lodgepole Pine	: 14.0	: 2,855	: 45	: 2,900	: 40,600
	:Spruce-Fir					
	: Sawtimber	: 18.0	: 3,488	: 80	: 3,568	: 64,000
4th	:Lodgepole Pine	: 13.5	: 2,945	: 45	: 2,990	: 40,600
	:Spruce-Fir					
	: Sawtimber	: 17.5	: 3,648	: 80	: 3,728	: 64,000
5th	:Lodgepole Pine	: 13.0	: 3,035	: 45	: 3,080	: 40,600
	:Spruce-Fir					
	: Sawtimber	: 16.5	: 3,808	: 80	: 3,888	: 64,000

Total Area

Lodgepole Pine

Sawtimber 56,000 acres

Poletimber 14,000 acres

Spruce-Fir

Sawtimber 91,000 acres

Table 13

Converting Factors To Convert
Cubic Foot Volume in Trees 5.0" and Larger D.B.H. To
Board Foot Volume in Trees 9.0" and Larger D.B.H.
By Sawtimber Types

Type	: Int. $\frac{1}{4}$ "	: Scrib. Dec. C
Douglas-fir	: 4.19	: 3.38
Lodgepole Pine	: 3.76	: 3.07
Spruce-Fir	: 4.77	: 4.04

Area and Volume in Unregulated Types

Aspen

There are 222,000 acres of aspen type in the working circle, and 86 percent of this is of poletimber size. The average volume per acre is 473 cubic feet.

$$194,000 \text{ acres} \times 473 \text{ cu. ft.} = 92 \text{ MM C.F.}$$

or 1,080 M cords.

Douglas-fir

There are 33,000 acres of Douglas-fir in the working circle. Fifty-eight percent of the area is in sawtimber-size stands and 39 percent is in poletimber-size stands.

Although stock and stand tables show some 5,000 board feet per acre, the volume is considered unmerchantable at this time due to steep, rocky terrain and excessive limbs. A condition class survey of this type will be made during this period. At that time management prescriptions will be drawn up and included in the compartment records.

Cutting Budget

The first 10-year cutting budget is shown in Tables 14 and 15 which follow. Selection of compartments in which the cutting will be done was based on the need for harvesting because of the age and condition of the stands.

A cutting budget has been prepared for the salvaging of the dead spruce type, Table 15. This will be subject to change at the time of a large pulpwood offering. No portions of the wilderness area are included in this cutting budget.

Table 14

Cutting Budget - Sawtimber
F.Y. 1963 - 1972

			Gross Saw-	Lodgepole Pine	Spruce-Fir	
			timber Area:	Sawtimber Type	Sawtimber Type	Total
Compartment	Ranger	in	Net Area:	Total:	Net Area:	Volume
No.:	Name	District	Compartment:	Acres:MM B.F.	Acres :MM B.F.	MM B.F.
021:	E. Brush Creek	:Eagle	: 1,590	: 68 : .45:	980	: 12.25 : 12.70
060:	Mill Creek	:Holy Cross	: 2,380	: 510 : 3.40:	1,100	: 13.75 : 17.15
061:	Timber Creek	:Holy Cross	: 270	: 52 : .35:	130	: 1.62 : 1.97
051:	Tate Gulch West	:Holy Cross	: 110	: 8 : .05:	60	: .75 : .80
052:	Tate Gulch East	:Holy Cross	: 450	: 37 : .25:	260	: 3.25 : 3.50
024:	Salt Creek	:Eagle	: 2,700	: 1,500 : 10.00:	450	: 5.62 : 15.62
010:	South Fork	:Eagle	: 3,640	: 1,380 : 9.20:	1,170	: 14.63 : 23.83
097:	Rocky Fork	:Frying Pan	: 2,810	: 458 : 3.05:	1,430	: 17.88 : 20.93
099:	West Sopris	:Crystal River:	: 300	: - : -	200	: 2.50 : 2.50
037:	Homestake	:Holy Cross	: 10,330	: 3,848 : 25.65:	3,380	: 42.25 : 67.90
076:	Basalt Mountain	:Frying Pan	: 800	: - : -	520	: 6.50 : 6.50
054:	Upper Wearyman	:Holy Cross	: 1,860	: 270 : 1.80:	970	: 12.13 : 13.93
070:	Red Sandstone	:Holy Cross	: 3,400	: 2,025 : 13.50:	450	: 5.62 : 19.12
003:	Sheephorn	:Eagle	: 2,390	: 1,268 : 8.45:	450	: 5.62 : 14.07
126:	Woody	:Aspen	: 840	: 105 : .70:	450	: 5.62 : 6.32
125:	Spruce	:Aspen	: 1,800	: 75 : .50:	1,100	: 13.75 : 14.25
114:	Difficult	:Aspen	: 4,390	: 1,642 : 10.95:	1,430	: 17.88 : 28.83
115:	New York	:Aspen	: 720	: 90 : .60:	390	: 4.88 : 5.48
116:	Lincoln	:Aspen	: 750	: 187 : 1.25:	330	: 4.12 : 5.37
121:	Hunter	:Aspen	: 1,990	: 142 : .95:	1,170	: 14.63 : 15.58
028:	Beaver Creek	:Holy Cross	: 2,840	: 105 : .70:	1,760	: 22.00 : 22.70
008:	Meadow Creek	:Eagle	: 1,800	: 150 : 1.00:	1,040	: 13.00 : 14.00
009:	Piney Lake	:Eagle	: 2,640	: 1,080 : 7.20:	780	: 9.75 : 16.95
Total				:15,000 :100.00:	20,000	:250.00 :350.00

Table 15

Cutting Budget For Dead Spruce Type

Compartment		Ranger	Net	Volume
No.	Name	District	Acres	M C.F.
:	:	:	:	:
003	:Sheephorn	:Eagle	: 1,950	: 7,108
010	:South Fork	:Eagle	: 400	: 1,458
024	:Salt Creek	:Eagle	: 450	: 1,640
028	:Beaver Creek	:Holy Cross	: 150	: 547
016	:Hardscrabble	:Eagle	: 1,200	: 4,374
017	:Frost Creek	:Eagle	: 900	: 3,280
022	:Nolan Creek	:Eagle	: 200	: 729
074	:Cottonwood	:Frying Pan	: 250	: 911
075	:Cattle Creek	:Frying Pan	: 2,150	: 7,837
078	:Taylor	:Frying Pan	: 550	: 2,005
080	:Downey	:Frying Pan	: 900	: 3,280
081	:Ruedi	:Frying Pan	: 200	: 729
006	:Bear Gulch	:Eagle	: 350	: 1,276
012	:Cache Gulch	:Eagle	: 350	: 1,276
:	:	:	:	:
Total	:	:	: 10,000	: 36,450

TRANSPORTATION

The road survey and construction program for the first 10-year period is shown in Table 16. These permanent roads are essential for the harvesting of the timber included in the cutting budgets shown in Tables 14 and 15, and are correlated with them.

Spot surfacing will be required on most system roads in order to extend the length of the hauling season beyond the present four or five months.

Table 16 shows the cost of building the roads to an all-purpose standard. Timber will only amortise a small portion of this cost. Most of the cost will have to be financed from all-purpose federal road funds when the road is constructed to a standard that will meet multiple-use needs.

Roads into the "dead spruce" area will not be scheduled until a large pulpwood sale materializes.

Rights-of-Way

Table 18 lists the rights-of-way necessary for removing the timber listed in the cutting budget. The rights-of-way should be obtained at least a year prior to the offering of the timber for sale.

Table 16

Timber Access Road Development Program - Sawtimber Types
F.Y. 1963 - 1972

Compartment	Road	Est.	Est. Cost	Total	Constr.	Date	
No. : Name	No. : Name	: Class : Miles	: Per Mile	: Cost	: By	: Survey	: Remarks
:	:	:	:	:	:	: Needed	:
097:Rocky Fork	:3159:Rocky Fork	:SN	: 10	: 14,000	:140,000:Contract	:F.Y. 1968	:Sell F.Y. 1968
099:West Sopris	:3204:West Sopris	:SN	: 3	: 10,000	: 30,000:Purchaser	:Completed	:Sell F.Y. 1963
037:Homestake	:3116:No Name	:SN	: 12	: 9,000	:108,000:Purchaser	:Completed	:Sell F.Y. 1963
037:Homestake	:3113:Homestake	:SN	: 14	: 10,000	:140,000:Purchaser	:Completed	:Sell F.Y. 1963
037:Homestake	:3114:Fancy Lake	:SN	: 11	: 9,000	: 99,000:Purchaser	:Completed	:Sell F.Y. 1963
037:Homestake	:3115:Missouri Lake	:SN	: 3	: 11,000	: 33,000:Purchaser	:Completed	:Sell F.Y. 1963
037:Homestake	:3242:Whitney Creek	:SN	: 5	: 6,000	: 30,000:Purchaser	:Completed	:Sell F.Y. 1963
028:Beaver Creek	:3126:Turquoise Lake	:SN	: 16	: 9,000	:144,000:Contract	:F.Y. 1964	:Sell F.Y. 1965
070:Red Sandstone	:3097:Red Sandstone	:SN	: 7	: 5,000	: 35,000:Purchaser	:F.Y. 1964	:Sell F.Y. 1964
003:Sheephorn	:3086:Cottonwood	:SN	: 11	: 8,000	: 88,000:Contract	:F.Y. 1965	:Sell F.Y. 1966
114:Difficult	:3183:Difficult Creek	:SN	: 12	: 10,000	:120,000:Purchaser	:F.Y. 1971	:Sell F.Y. 1972
114:Difficult	:3185:Columbia Creek	:SN	: 5	: 10,000	: 50,000:Purchaser	:F.Y. 1971	:Sell F.Y. 1972
115:New York	:3182:New York Creek	:SN	: 10	: 10,000	:100,000:Purchaser	:F.Y. 1971	:Sell F.Y. 1972
116:Lincoln	:3180:Lincoln Creek	:SN	: 10	: 10,000	:100,000:Purchaser	:F.Y. 1971	:Sell F.Y. 1972
121:Hunter Creek	:3174:Hunter Creek	:SN	: 14	: 11,000	:154,000:Contract	:F.Y. 1971	:Sell F.Y. 1972
008:Meadow Creek	:3089:East Meadow Creek	:SN	: 3	: 8,000	: 24,000:Purchaser	:F.Y. 1968	:Sell F.Y. 1969
008:Meadow Creek	:3095:Meadow Creek	:SN	: 7	: 8,000	: 56,000:Contract	:F.Y. 1968	:Sell F.Y. 1969
009:Piney Lake	:3096:Piney Lake	:SN	: 4	: 8,000	: 32,000:Purchaser	:F.Y. 1968	:Sell F.Y. 1969

Table 17

Timber Access Road Development Program - Dead Spruce Type
F.Y. 1963 - 1972

Compartment		Road		:Est. Cost:		:Total		:Constr.		:Date	
No.:	Name	No.:	Name	:Class:	Miles:	Per Mile	:Cost	:By	:Survey	:Needed	
003:	Sheephorn	:3086:	Cottonwood	:SN	: 11	: 8,000	: 88,000:	Purchaser:		*	
003:	Sheephorn	:3087:	Piney Pass	:SN	: 10	: 10,000	:100,000:	Purchaser:			
003:	Sheephorn	:3088:	Piney Ridge	:SN	: 6	: 5,000	: 30,000:	Purchaser:			
003:	Sheephorn	:3090:	Elliot Pass	:SN	: 11	: 5,000	: 55,000:	Purchaser:			
010:	South Fork	:3092:	Piney	:SN	: 14	: 6,000	: 84,000:	Purchaser:			
010:	South Fork	:3095:	Meadow Creek	:SN	: 7	: 8,000	: 56,000:	Purchaser:			
028:	Beaver Creek	:3126:	Turquoise Lake	:SN	: 16	: 9,000	:144,000:	Purchaser:			
024:	Salt Creek	:3129:	Squaw Creek	:SN	: 6	: 9,000	: 54,000:	Purchaser:			
024:	Salt Creek	:3130:	Salt Creek	:SN	: 7	: 10,000	: 70,000:	Purchaser:			
024:	Salt Creek	:3266:	Bellyache Mtn.	:SN	: 10	: 7,000	: 70,000:	Purchaser:			
016:	Hardscrabble	:3139:	Hardscrabble	:SN	: 19	: 10,000	:190,000:	Purchaser:			
015:	Mucky Lake	:3140:	Gypsum Creek	:SN	: 18	: 7,000	:126,000:	Purchaser:			
075:	Cattle Creek	:3144:	Red Table Mtn.	:SN	: 30	: 6,000	:180,000:	Purchaser:			
075:	Cattle Creek	:3147:	Cattle Creek	:SN	: 12	: 7,000	: 84,000:	Purchaser:			
078:	Taylor	:3149:	Taylor Creek	:SN	: 8	: 10,000	: 80,000:	Purchaser:			
081:	Ruedi	:3154:	Ruedi Creek	:SN	: 5	: 10,000	: 50,000:	Purchaser:			

*Dependent on sale of dead spruce for pulpwood.

Table 18

Sawtimber Access Right-of-Way Needs

Compartment		Road	No.		Volume	Year
No.	Name	No.	Name	Ease-ments	MM B.F.	Needed
037	Homestake	3115	Missouri Lake	1	20.00	F.Y. 1963
028	Beaver Creek	3126	Turquoise Lake	2	22.70	F.Y. 1964
121	Hunter Creek	3174	Hunter Creek	2	15.58	F.Y. 1970
009	Piney Lake	3096	Piney Lake	1	16.95	F.Y. 1968
028	Beaver Creek	3126	Turquoise Lake	2		*
024	Salt Creek	3266	Bellyache Mtn.	2		*
078	Taylor	3149	Taylor Creek	1		*
081	Ruedi	3154	Ruedi Creek	1		

*Dependent upon the sale of dead spruce.

SALES POLICY

Sufficient timber will be made available to operators to keep at least a three-year supply under contract at all times.

There is not sufficient established mill capacity to harvest the allowable cut in sawtimber. The present cut is averaging approximately 9,000 M B.F. per year, 20 percent of which is dead and not chargeable to the allowable cut. All present operations are small. A large sale of about 50 million board feet will be offered, either during the last quarter of F.Y. 1962 or early in F.Y. 1963, to attract a new operation to cut 7 to 10 million board feet per year. When this sale is made, more such offerings will be prepared.

The following is a guide established for the working circle for the size of timber sales needed.

<u>Point of Manufacture</u>	<u>Mill Capacity</u> MM B.F.	<u>Size of Sales</u> MM B.F.
Pando	7-10	20-50
Aspen	7-10	20-50
Minturn	3	6-10
Minturn	2	4-10
Eagle	4	8-12
Lenado	3	6-10
Redcliff	1	2-3
Basalt	1	2-3
Rifle	3	6-10
Upper Frying Pan	1	2-3
Carbondale	4	8-12
Rifle	1	2-3

Merchantability Specifications

<u>Product and Species</u>	<u>Specification</u>
<u>Sawtimber and Dead Spruce</u>	:
All Species	: <u>Trees</u>
	: 10.0 inches d.b.h.
	: <u>Top Diameter</u>
All Species	: 8.0 inches d.i.b.
	: <u>Stump Height</u>
All Species	: 12.0 inches
<u>Pulpwood</u>	:
All Species except	: <u>Trees</u>
Dead Spruce	: 5.0 inches d.b.h. and having at
	: least one stick 8.0 feet long.
	: <u>Top Diameter</u>
All Species	: 4.0 inches d.o.b.
	: <u>Stump Height</u>
All Species	: 8.0 inches

Note: Some lodgepole pine sawtimber sales may offer lodgepole pine to a 6.0 inch top d.i.b. and to an 8.0 inch d.b.h.

Logging Methods

Logging will be done in all types by trucks, animals, tractors and cable equipment. The method to be used will be discussed in the presale prescription and prospectus and specified in the timber sale contract.

In the spruce-fir type, special consideration will be given to practices and methods which will eliminate potential build-up of Engelmann spruce bark beetle populations in cull and large slash material. Complete slash disposal, entire tree skidding with slash and cull disposal at the landings, or other appropriate methods will be considered for approval on an individual case basis.

TIMBER STAND IMPROVEMENT

Reforestation

The total planting job to be done by 1980 and that planned for accomplishment during the current 10-year period are shown in Tables 19 and 20.

For the 10-year period, scarifying, slash burning or other means to obtain natural reproduction will be done on 2,000 acres of cutover lodgepole pine type and 5,000 acres of spruce-fir type.

Thinning

Noncommercial thinning will be done on 2,000 acres of lodgepole pine to be cut over in sawtimber sales during this period.

Advantage will be taken of small sales for posts, poles and mine props to accomplish commercial thinnings.

Table 19

The Total Planting Job - F.Y. 1963 - 1980

Type	: Nonstocked:	: Understocked : : Seedling+ : Saplings	: Pole Stands : : To Be : Clear Cut	: Sawtimber : : Areas : : Cut Over : : After 1960:	: Dead Spruce : : To Be : Cut Over	: Aspen Stands : : In Which : : Conifers : : Will Be : : Re-established:	: Total
			<u>1/</u>		<u>2/</u>	<u>3/</u>	
Lodgepole Pine	: 151	: 120	: 7,000	: -	: -	: -	: 7,271
Spruce-Fir	: 11,712	: 3,362	: -	: 20,000	: -	: -	: 35,074
Subalpine and Corkbark Fir	: -	: 1,842	: -	: -	: -	: -	: 1,842
					: 23,350	: 55,000	: 78,350
Total	: 11,863	: 5,324	: 7,000	: 20,000	: 23,350	: 55,000	: 122,537

1/ Dependent on establishment of an industry to utilize such material. Cut to start second 10-year period.
45% of pole stands stagnated. Adjustment period of 50 years.

2/ Dependent on establishment of an industry to utilize such material. Calculated that 75% is operable
Planting will be at 300 per acre.

3/ Calculated at 50% operable. 50% of operable will re-establish naturally.

Table 20

The 10-Year Planting Job - F.Y. 1963 - 1972*

Type	:Nonstocked:	:Understocked: Pole Stands : Seedling- To Be : Saplings Clear Cut :	: Sawtimber : Areas : Cut Over : After 1960 :	: Dead Spruce : To Be : Cut Over :	: Aspen Stands : In Which : Conifers : Will Be : Re-established :	: Total :
Lodgepole Pine	: -	: -	: -	: -	: -	: -
Spruce-Fir	: 3,904	: 1,121	: -	: 6,666	: -	: 11,691
Subalpine and Corkbark Fir	: -	: 614	: -	: -	: -	: 614
					: 18,333	: 18,333
Total	: 3,904	: 1,735	: -	: 6,666	: -	: 30,638

*Calculated at one-third of 20-year total job to allow for the establishment of a nursery and development of techniques for large scale planting in our rugged, rocky country and dead spruce type.

PROTECTION

Insects

The Engelmann spruce bark beetle is at present at an endemic level in the spruce-fir type in all compartments of the working circle. An objective of this plan is to keep these infestations from building up to an epidemic level.

The action to meet this objective will be as follows:

1. Train all field going personnel in detection and reporting procedures for all species of destructive forest insects native to this area.
2. Train all timber operators and their woods bosses and contractors to recognize and report infestations which might be expected within their operating areas.
3. Train other key people such as stockmen, dude packers and State Game and Fish officers to detect and report any unusual destructive insect activity they might notice in their travels.
4. Each district will be required to make, maintain and activate an insect detection plan. The plan will cover potential insect build-up areas such as around sale areas, cyclone and hurricane damaged areas, and stands of overmature and decadent timber which will be investigated each year to prevent build up to an epidemic level.
5. All future timber sale contracts and modification of existing contracts in the spruce-fir type will contain special insect control clauses. These clauses will require treatment such as bunching and burning all Engelmann spruce slash and cull material resulting from logging. The method used will be that which is considered most practicable under the existing conditions. Burning will be done by the Forest Service, with cooperative deposits, during a period when the bark beetles are in the cull and slash material.

On areas where the above does not fully control the bark beetles and on small sale areas where such action is impracticable, a trap tree program will be used to control the insect.

Disease

Dwarfmistletoe is found in varying amounts in most of our lodgepole pine sawtimber stands. The following action to effect control of the disease will be taken.

1. Sales with Disease Control-- Sale Area Betterment Provision

Control will be by felling, girdling, poisoning or pushing over and burning all infected residual trees on commercially clear cut areas. This will be done as part of the sale area betterment work with K-V funds.

2. Older Sales without Disease Control -- Sale Area Betterment Provision

Residual trees of commercial size will be sold as soon as practicable. Disease control--sale area betterment funds will be collected on all such sales. These funds will be supplemented with P&M funds to effect dwarfmistletoe control. A survey will be made to determine the extent of the job, and the controls needed. Control measures will be prescribed. All control work will be accomplished by F.Y. 1972. Some 13,000 acres will need to be examined, with the probability that three or four thousand acres will need treatment. Most of the area occurs on the Holy Cross District, but some also occurs on the Eagle District.

Animals and Rodents

Porcupines

1. Instruct all Forest Service employees to destroy porcupines when found.
2. Educate the public in the importance of porcupine control in timber management and conservation.
3. Poison porcupine dens in vicinity of all new plantations.

Mice

Check mouse populations and apply poison when it is evident that populations are reaching a cyclic peak. This will be done around new plantations and seedings and on areas where natural regeneration is to be obtained.

Livestock

All plantations will be fenced, if necessary, to protect the trees from animal damage. The fences will be maintained until the trees are above browse height. Areas to be regenerated by natural means may be fenced, if necessary, for the protection of the reproduction against animal damage.

Wildlife

Plantations will not be established on heavily used winter game ranges.

Fire

It is the objective of this plan to treat all logged areas so that the PAR for the working circle will not be exceeded. PAR for this working circle is 97 burned acres per year on commercial forest land. To attain this objective the 10-year fire control program for fire protection will be:

1. Reduce all slash areas to at least a MM fuel type within two years after logging.
2. Maintain a supply of equipment and a protection organization adequate to keep commercial timberland fires within the annual PAR set up in the fire prevention plans.
3. Provide for the purchase of additional slash disposal equipment, such as tankers, chippers, pumps and firing equipment until sufficient equipment is available to control slash on approximately 1,500 acres per year.
4. Continue the research into and the measurement of cumulative effects in the dead spruce type.
5. On areas where it is not possible to reduce the fire hazard to an acceptable standard, it will be necessary to provide extra protection funds to insure detection and protection during high fire danger and high risk periods.

SUPPORTING DATA

Compartment Records

A system of compartment records for each of the six ranger districts within this working circle will be established within one year after the approval of this plan. This record will consist of Form R2-2400-19 and a 2-inch-to-the-mile map for each compartment within the district. These will be maintained in an atlas-size binder. The R2-2400-19 will be posted at least once annually. Compartment descriptions will become a part of this record.

Timber Inventory

The inventory data on which this plan is based was obtained from the Cooperative Forest Survey - Region 2 Inventory Program conducted in 1958.

The inventory was conducted to standards prescribed and agreed to by Forest Survey of the Intermountain Forest and Range Experiment Station and the Division of Timber Management of Region 2 (Field Instruction for Forest Inventory, Rocky Mountain Region, 1956). Forest Survey read the plots and processed the data. Region 2 delineated the types on aerial photographs, transferred the types to planimetric maps, printed the final type maps and calculated the area of the types.

Sampling Error

Volume data is based on plots taken at 238 locations throughout the entire forest. It was estimated that this number of locations would give a sampling error not to exceed five percent (one standard error) for cubic foot volume for the forest as a whole. Table 21 shows the number of locations by volume stratum for the forest. There were 161 locations (two plots per location) on the Holy Cross Working Circle. This would give a sampling error of not to exceed six percent using the coefficient of variation for the entire forest.

The area calculations are based on a 100 percent type mapping job.

Data Processing

Forest Survey of the Intermountain Forest and Range Experiment Station processed the data through the IBM Section of the Pacific Southwest Station. This was done in accordance with "Plan for Compilation of the Intermountain Forest Survey, Rocky Mountain Area by IBM Method," dated October 1, 1956, by Robert M Miller.

The NFA Tables are on file in the forest supervisor's office. These are:

Area

NFA 2 - Compartment Area

NFA 3 - Block Area Summary

NFA 4 - Working Circle Area Summary

Volume

NFA 6 - Average Volume Per Acre By Volume Stratum

NFA 7 - Average Volume Board Foot Volume Per Acre For Sawtimber
Size Trees By Volume Stratum

NFA 31- Average Past Volume (10 Years Past) Per Acre By Volume
Stratum

Miscellaneous Tables - Number of trees per acre and various
Forest Survey summaries

Copies of the plot tally sheets are on file in the forest supervisor's office.

Aerial photographs on which the photo interpretation was done are on file at the Denver Federal Record Center, Denver, Colorado.

Plates from which the type maps were printed are stored in the Division of Timber Management, Forest Service, Denver, Colorado.

Method for Calculating Periodic Annual Net Growth

NFA Table 31 in the IBM binder gives the average adjusted 10-year growth increment and the 10-year mortality by growth strata, species, and two-inch d.b.h. classes. The volumes are shown in both board feet and cubic feet.

The growth stratum codes are as follows:

GS-01 = All conifer sawtimber stands.

GS-02 = All conifer poletimber stands.

GS-03 = All conifer seedling and sapling and nonstocked stands.

GS-04 = All hardwood stands.

The gross 10-year growth is based upon merchantability class (MC-1) trees. These are all live, merchantable trees. Mortality is shown under merchantability class (MC-7) trees. These are all mortality trees. The Forest Survey crews estimated the trees that died during the past five years. This volume was then doubled to put it on the same period as the growth. The growth was based on the past 10 years.

The periodic annual net growth per acre can be determined for any given species and d.b.h. class within a growth stratum, or the total of all species in d.b.h. classes within a growth stratum, by subtracting the volume shown for the average 10-year mortality (MC-7) from the average 10-year growth increment (MC-1) and dividing by 10.

Growth strata do not correspond to volume strata. The total volume of timber in the working circle and the allowable cuts are based upon volume strata. It was, therefore, necessary to construct a growth and mortality table for the volume strata using the data given in NFA Table 31. This was done by weighting the growth and mortality of the species in the growth strata by the percent of each species in the volume strata.

Table 22

Relation Between Age Classes and Size Classes
Forest Survey Site Trees

Type	Age Class (Years)	Stand-Size Class							
		Nonstocked		Seedling- Sapling		Poletimber		Sawtimber	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent
		Trees	Percent	Trees	Percent	Trees	Percent	Trees	Percent
Douglas- fir	1 - 19:	:	:	:	:	:	:	:	:
	20 - 39:	:	:	:	:	3	21.42	:	:
	40 - 59:	:	:	:	:	6	42.86	:	:
	60 - 79:	:	:	:	:	2	14.29	6	27.27
	80 - 99:	:	:	:	:	2	14.29	1	4.54
	100 - 119:	:	:	:	:	:	:	3	13.64
	120 - 139:	:	:	:	:	:	:	2	9.09
	140 - 159:	:	:	:	:	1	7.14	3	13.64
	160 - 179:	:	:	:	:	:	:	1	4.54
	180 - 199:	:	:	:	:	:	:	3	13.64
	200+	:	:	:	:	:	:	3	13.64
Total		:	:	:	:	14	100.00	22	100.00
Lodgepole Pine	1 - 19:	:	:	:	:	:	:	:	:
	20 - 39:	:	:	:	:	3	6.81	:	:
	40 - 59:	:	:	:	:	12	27.28	2	3.12
	60 - 79:	:	:	:	:	20	45.45	14	21.88
	80 - 99:	:	:	:	:	4	9.09	18	28.12
	100 - 119:	:	:	:	:	:	:	2	3.13
	120 - 139:	:	:	:	:	1	2.27	2	3.13
	140 - 159:	:	:	:	:	:	:	6	9.37
	160 - 179:	:	:	:	:	2	4.55	1	1.56
	180 - 199:	:	:	:	:	1	2.27	8	12.50
	200+	:	:	:	:	1	2.27	11	17.19
Total		:	:	:	:	44	100.00	64	100.00
Subalpine Fir	1 - 19:	:	:	:	:	:	:	:	:
	20 - 39:	:	:	:	:	:	:	:	:
	40 - 59:	:	:	:	:	4	44.50	5	9.09
	60 - 79:	:	:	1	50.00	1	11.10	12	21.81
	80 - 99:	:	:	1	50.00	2	22.20	15	27.28
	100 - 119:	:	:	:	:	2	22.20	10	18.18
	120 - 139:	:	:	:	:	:	:	7	12.73
	140 - 159:	:	:	:	:	:	:	2	3.63
	160 - 179:	:	:	:	:	:	:	3	5.46
	180 - 199:	:	:	:	:	:	:	:	:
	200+	:	:	:	:	:	:	1	1.82
Total		:	:	2	100.00	9	100.00	55	100.00

(Table Continued)

Table 22 (Continued)

Relation Between Age Classes and Size Classes
Forest Survey Site Trees

Type	Age Class (Years)	Stand-Size Class							
		Nonstocked		Seedling- Sapling		Poletimber		Sawtimber	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent
		Trees	Percent	Trees	Percent	Trees	Percent	Trees	Percent
Engelmann Spruce	1 - 19:	:	:	:	:	:	:	:	:
	20 - 39:	1	33.33	4	100.00	1	4.54	:	:
	40 - 59:	2	66.67	:	:	13	59.09	2	1.92
	60 - 79:	:	:	:	:	4	18.18	12	11.54
	80 - 99:	:	:	:	:	1	4.55	6	5.77
	100 - 119:	:	:	:	:	:	:	15	14.42
	120 - 139:	:	:	:	:	2	9.09	11	10.58
	140 - 159:	:	:	:	:	:	:	15	14.42
	160 - 179:	:	:	:	:	:	:	7	6.73
	180 - 199:	:	:	:	:	:	:	10	9.62
	200+	:	:	:	:	1	4.55	26	25.00
Total	:	3	100.00	4	100.00	22	100.00	104	100.00
Aspen	1 - 19:	:	:	:	:	:	:	:	:
	20 - 39:	:	:	3	37.50	3	7.69	:	:
	40 - 59:	:	:	4	50.00	10	25.64	1	5.26
	60 - 79:	:	:	1	12.50	20	51.28	2	10.52
	80 - 99:	:	:	:	:	4	10.26	7	36.85
	100 - 119:	:	:	:	:	1	2.56	3	15.79
	120 - 139:	:	:	:	:	:	:	2	10.52
	140 - 159:	:	:	:	:	1	2.57	3	15.79
	160 - 179:	:	:	:	:	:	:	1	5.27
	180 - 199:	:	:	:	:	:	:	:	:
	200+	:	:	:	:	:	:	:	:
Total	:	:	:	8	100.00	39	100.00	19	100.00

Table 23

Average Age and Height By Species
For D.B.H. 2 Inch Classes
Forest Survey Site Trees

Stand	:		:	Lodgepole Pine	:	Engelmann Spruce	:	Subalpine Fir	:	Douglas-fir	:	Aspen										
Size	:	D.B.H.	:	Age	:	Height	:	Age	:	Height	:	Age	:	Height								
Class	:	2" Class	:	Years	:	Feet	:	Years	:	Feet	:	Years	:	Feet								
	:		:		:		:		:		:		:									
Seedling-	:		:		:		:		:		:		:									
Sapling	:	$\frac{1}{2}$ ' ht. to 0.9" D.B.H.	:		:		:		:		:		:									
	:	1.0- 2.9	:		:		:		:		:		:									
	:	3.0- 4.9	:		:		:	34	:	22	:		:	36	:	25						
	:		:		:		:		:		:		:									
Poletimber	:	5.0- 6.9	:	44	:	64	:	53	:	29	:	43	:	35	:	66	:	34	:	57	:	37
	:	7.0- 8.9	:	79	:	45	:	52	:	42	:	85	:	44	:	49	:	41	:	71	:	50
	:	9.0-10.9	:	85	:	49	:	112	:	47	:	106	:	62	:	59	:	48	:	92	:	61
	:		:		:		:		:		:		:		:		:		:		:	
Small	:	11.0-12.9	:	115	:	62	:	124	:	60	:	110	:	73	:	124	:	50	:	97	:	62
Sawtimber	:	13.0-14.9	:	149	:	65	:	170	:	75	:	105	:	71	:	116	:	58	:	114	:	60
	:	15.0-16.9	:	133	:	73	:	158	:	76	:	128	:	78	:	127	:	57	:	98	:	69
	:	17.0-18.9	:	119	:	74	:	200	:	82	:	173	:	67	:	198	:	51	:	67	:	49
	:	19.0-20.9	:		:		:	175	:	86	:		:		:		:		:		:	
	:		:		:		:		:		:		:		:		:		:		:	
Large	:	21.0-22.9	:		:		:	159	:	111	:	116	:	70	:		:		:		:	
Sawtimber	:	23.0-24.9	:		:		:	276	:	119	:		:		:	185	:	98	:		:	
	:	25.0-26.9	:		:		:	138	:	81	:	185	:	71	:	111	:	78	:		:	

Table 24

Summary of Total Area, Net Volume Per Acre and Total Volume By Species
For the Major Sawtimber Types

Types	Volume		Species						
	Area	Per Acre	Douglas-	Ponderosa	Lodgepole	Subalpine	Engelmann		
	Acres	(Bd. Ft.)*	fir	Pine	Pine	Fir	Spruce	Aspen	Total
			M B.F.	M B.F.	M B.F.	M B.F.	M B.F.	M B.F.	M B.F.
Douglas-fir	19,120	5,091.94	83,504	6,893	1,976	1,577	3,281	127	97,358
Lodgepole Pine	75,834	8,745.43	1,194		531,755	43,837	84,558	1,857	663,201
Spruce-Fir	181,229	12,790.13	8,808		89,472	462,661	1,668,456	88,545	2,317,942
Aspen	1,344	6,294.33	68			1,475		6,917	8,460
Total	277,527	11,123.10	93,574	6,893	623,203	509,550	1,756,295	97,446	3,086,961

*Board foot volume is in trees 9.0" D.B.H. and larger and based on Scribner Decimal C Log Rule.

Table 25

Summary of Annual Growth and Mortality
For Sawtimber Types

		Board Feet in Trees 9.0" D.B.H.& Larger:					Cubic Feet in Trees 5.0"D.B.H.& Larger				
		Per Acre					Per Acre				
Types	Area	Gross	Mor-	Net	Total	Total			Total	Total	
					Annual:	Annual:			Annual:	Annual:	
					Net	Mor-	Gross	Mor-	Net	Mor-	
Acres	Growth	tality	Growth	Growth	tality	Growth	tality	Growth	Growth	tality	
		B.F.	B.F.	B.F.	M B.F.	M B.F.	C.F.	C.F.	C.F.	M C.F.	M C.F.
Douglas-fir	19,120	11.92	2.87	9.05	173	55	3.31	1.05	2.26	43	20
Lodgepole Pine	75,834	54.64	19.53	35.11	2,663	1,481	14.30	5.88	8.42	639	446
Spruce-Fir	181,229	125.87	49.73	76.14	13,799	9,013	30.81	14.70	16.11	2,920	2,664
Aspen	1,344	12.66	8.21	4.45	6	11	3.86	3.09	0.77	1	4
Total	277,527	98.03	38.06	59.97	16,641	10,560	24.27	11.29	12.98	3,603	3,134

Table 26

Average Net Volume Per Acre
By Crown Density Classes and Species

DOUGLAS-FIR SAWTIMBER TYPE

Species	Crown Density Classes						Percent of Species Based On	
	Medium (VS-01)		Poor (VS-02)		Weighted Average		Bd.Ft.	Cu.Ft.
	Bd. Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.		
Douglas-fir	5,970.53	2,027.16	3,755.56	1,041.36	4,367.11	1,313.54	85.77	87.15
Ponderosa Pine			498.51	102.97	360.87	74.54	7.08	4.94
Lodgepole Pine			142.71	29.45	103.31	21.32	2.03	1.41
Subalpine Fir	222.07	119.75	29.36	7.49	82.57	38.48	1.62	2.56
Engelmann Spruce	620.12	173.30			171.22	47.85	3.37	3.18
Aspen		27.42	9.48	5.41	6.86	11.49	0.13	0.76
Total	6,812.72	2,347.63	4,435.62	1,186.68	5,091.94	1,507.22	100.00	100.00
Area in Volume Stratum								
Acres	5,225		13,835		19,120			
Percent	28		72		100			

Note: Board Foot Volume in trees 9.0" D.B.H. and larger.
Cubic Foot Volume in trees 5.0" D.B.H. and larger.

Table 27

Stock and Stand Table
By D.B.H. and Crown Density Classes

DOUGLAS-FIR SAWTIMBER TYPE

Average Per Acre										
D.B.H. Classes		Crown Density Classes								
		Medium (VS-01)			Poor (VS-02)			Weighted Average		
		Net Volume			Net Volume			Net Volume		
		No. of	Scribner		No. of	Scribner		No. of	Scribner	
10"	2"	Trees	Dec. C	Cu. Ft.	Trees	Dec. C	Cu. Ft.	Trees	Dec. C	Cu. Ft.
0	1.0- 2.9:									
	3.0- 4.9:									
1	5.0- 6.9:	50.00		119.69	21.88		50.01	29.64		69.24
	7.0- 8.9:	58.33		363.24	18.75		87.90	29.68		163.92
	9.0-10.9:	83.33	2,383.99	819.12	18.75	540.00	188.35	36.58	1,049.13	362.50
2	11.0-12.9:	24.17	1,210.95	337.49	10.63	470.53	134.46	14.37	674.96	190.52
	13.0-14.9:	16.66	1,482.05	353.18	8.12	616.66	153.70	10.48	855.59	208.78
	15.0-16.9:	5.00	665.97	147.71	5.63	643.43	147.49	5.46	649.65	147.55
	17.0-18.9:				1.87	285.16	62.64	1.35	206.43	45.35
	19.0-20.9:	0.83	335.79	66.74	1.57	315.30	65.70	1.37	320.96	65.99
3	21.0-22.9:	0.83	280.66	55.25	0.31	63.75	13.50	0.45	123.64	25.03
	23.0-24.9:				0.94	389.75	74.96	0.68	282.14	54.26
	25.0-26.9:	0.83	453.31	85.21				0.23	125.16	23.53
	27.0-28.9:				0.31	224.29	41.85	0.23	162.36	30.30
	29.0-30.9:				1.25	739.75	138.15	0.90	535.51	100.00
4	31.0-32.9:									
	33.0-34.9:				0.31	147.00	27.97	0.22	106.41	20.25
Total		239.98	6,812.72	2,347.63	90.32	4,435.62	1,186.68	131.64	5,091.94	1,507.22

Table 28

Average Net Volume Per Acre
By Crown Density Classes and Species

LODGEPOLE PINE SAWTIMBER TYPE

Species	Crown Density Classes								Percent of	
	Well (VS-03)		Medium (VS-04)		Poor (VS-05)		Weighted Average		Species Based	
	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.
Douglas-fir			43.13	10.76			15.80	3.94	0.18	0.14
Lodgepole Pine	14,363.12	3,433.44	9,747.02	2,688.13	5,384.31	1,918.76	7,012.03	2,205.58	80.18	77.50
Subalpine Fir	3,026.77	866.91	575.77	320.57	566.38	227.47	578.18	263.73	6.61	9.27
Engelmann Spruce	1,255.12	373.01	2,028.41	647.14	583.35	189.86	1,114.66	357.88	12.75	12.58
Aspen	761.83	162.11			35.16	22.31	24.76	14.62	0.28	0.51
Total	19,406.84	4,835.47	12,394.33	3,666.60	6,569.20	2,358.40	8,745.43	2,845.75	100.00	100.00
Area in Volume Stratum										
Acres	261		27,816		47,757		75,834			
Percent			37		63		100			

Note: Board Foot Volume in Trees 9.0" D.B.H. and Larger.
Cubic Foot Volume in Trees 5.0" D.B.H. and Larger.

Table 29

Stock and Stand Table
By D.B.H. and Crown Density Classes

LODGEPOLE PINE SAWTIMBER TYPE

Average Per Acre												
Crown Density Classes												
D.B.H. Classes	Well (VS-03)			Medium (VS-04)			Poor (VS-05)			Weighted Average		
	Net Volume			Net Volume			Net Volume			Net Volume		
	No.of	Scribner		No.of	Scribner		No.of	Scribner		No.of	Scribner	
10" : 2"	Trees	Dec. C	Cu. Ft.	Trees	Dec. C	Cu. Ft.	Trees	Dec. C	Cu. Ft.	Trees	Dec. C	Cu. Ft.
0 : 1.0- 2.9:	:	:	:	:	:	:	:	:	:	:	:	:
: 3.0- 4.9:	:	:	:	:	:	:	:	:	:	:	:	:
1 : 5.0- 6.9:	100.00:	:	419.03:	80.77:	:	364.78:	101.79:	:	430.57:	94.09:	:	406.45
: 7.0- 8.9:	35.00:	:	244.15:	75.01:	:	601.58:	66.08:	:	479.73:	69.24:	:	523.54
: 9.0-10.9:	100.00:	6,470.40:	1,468.56:	65.39:	3,846.86:	885.51:	35.72:	1,820.77:	430.33:	46.80:	2,578.33:	600.50
2 : 11.0-12.9:	42.00:	4,099.42:	885.56:	41.53:	3,633.22:	794.16:	26.61:	2,078.02:	461.10:	32.12:	2,654.25:	584.48
: 13.0-14.9:	27.50:	3,826.60:	799.55:	22.30:	2,755.76:	581.21:	11.79:	1,426.44:	301.26:	15.69:	1,921.26:	405.44
: 15.0-16.9:	14.00:	2,652.75:	541.81:	8.27:	1,479.35:	302.57:	5.36:	778.01:	161.52:	6.45:	1,041.14:	214.45
: 17.0-18.9:	4.00:	894.39:	180.40:	1.92:	469.51:	94.28:	1.61:	353.10:	71.36:	1.74:	397.56:	80.12
: 19.0-20.9:	3.00:	838.58:	167.51:	0.58:	164.88:	32.87:	0.36:	112.86:	22.53:	0.46:	134.37:	26.81
3 : 21.0-22.9:	0.50:	155.40:	30.06:	0.19:	44.75:	9.64:	:	:	:	0.07:	16.92:	3.63
: 23.0-24.9:	0.50:	183.95:	38.96:	:	:	:	:	:	:	:	0.63:	0.13
: 25.0-26.9:	:	:	:	:	:	:	:	:	:	:	:	:
: 27.0-28.9:	:	:	:	:	:	:	:	:	:	:	:	:
: 29.0-30.9:	0.50:	285.35:	59.85:	:	:	:	:	:	:	:	0.97:	0.20
Total	:327.00:	19,406.84:	4,835.41:	295.96:	12,394.33:	3,666.60:	249.32:	6,569.20:	2,358.40:	266.66:	8,745.43:	2,845.75

Table 30

Average Net Volume Per Acre
By Crown Density Classes and Species

LODGEPOLE PINE POLETIMBER TYPE

Species	Crown Density Classes				Percent By Species
	Well (VS-12)	Medium (VS-13)	Poor (VS-14)	Wt. Average	
	Cu. Ft.	Cu. Ft.	Cu. Ft.	Cu. Ft.	
Douglas-fir	25.39	15.06		20.27	1.02
Lodgepole Pine	1,789.73	1,426.71	854.14	1,605.94	80.83
Subalpine Fir	131.31	21.81		89.44	4.50
Engelmann Spruce	36.34	20.62	5.80	29.28	1.48
Aspen	257.97	282.85		241.60	12.17
Total	2,240.74	1,767.05	859.94	1,986.53	100.00
Area in Volume Stratum					
Acres	45,401	19,619	6,325	71,345	
Percent	64.00	27.00	9.00	100.00	

Note: Cubic Foot Volume in Trees 5.0" D.B.H. and Larger.

Table 31

Stock and Stand Table
By D.B.H. and Crown Density Classes

LODGEPOLE PINE POLETIMBER TYPE

		Average Per Acre							
		Crown Density Classes						Weighted Average	
		Well (VS-12)		Medium (VS-13)		Poor (VS-14)			
D.B.H.		Net		Net		Net		Net	
Classes	No. of	Volume	No. of	Volume	No. of	Volume	No. of	Volume	
10" : 2"	Trees	Cu. Ft.	Trees	Cu. Ft.	Trees	Cu. Ft.	Trees	Cu. Ft.	
0	1.0- 2.9:								
	3.0- 4.9:								
1	5.0- 6.9:	112.49	415.87	72.73	244.77	40.00	155.33	95.06	345.46
	7.0- 8.9:	116.66	801.21	79.54	525.75	40.00	238.63	99.58	674.99
	9.0-10.9:	45.83	474.38	43.18	453.03	30.00	312.62	43.68	453.98
2	11.0-12.9:	7.51	132.66	14.99	255.42	7.00	104.27	9.52	163.83
	13.0-14.9:	5.84	153.28	7.26	177.46	2.50	49.09	5.93	150.55
	15.0-16.9:	5.84	224.60	1.36	53.60			4.08	157.45
	17.0-18.9:	0.42	14.40	0.68	34.57			0.45	18.64
	19.0-20.9:	0.42	24.34	0.46	22.45			0.39	21.63
Total		295.01	2,240.74	220.20	1,767.05	119.50	859.94	258.69	1,986.53

Table 32

Average Net Volume Per Acre
By Crown Density Classes and Species

SPRUCE-FIR SAWTIMBER TYPE

Species:	Stand Size and Crown Density Classes										Percent of	
	Large Sawtimber					Small Sawtimber					Weighted	
	Well & Medium (VS6)					Well (VS7) : Medium (VS8) : Poor (VS9)					Average	
	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.
Douglas-fir	3,379.85	650.33			58.03	11.42	32.20	6.46	49.18	9.71	0.38	0.30
Lodgepole Pine			1,666.64	340.22	498.31	109.24	417.78	116.03	494.11	118.56	3.86	3.74
Subalpine Fir	1,229.19	515.07	4,397.36	1,214.02	2,769.69	889.21	2,187.74	662.39	2,552.51	796.25	19.96	25.14
Engelmann Spruce	12,275.44	2,620.69	12,862.69	2,677.03	12,049.04	2,627.58	5,644.64	1,422.69	9,205.98	2,089.76	71.98	65.97
Aspen	75.85	17.67			677.08	203.69	299.15	104.54	488.35	153.42	3.82	4.85
Total	16,960.33	3,803.76	18,926.69	4,231.27	16,052.15	3,841.14	8,581.51	2,312.11	12,790.13	3,167.70	100.00	100.00
Area in Volume Stratum												
Acres 220 :			5,050 :		94,866 :		81,093 :		181,229 :			
Percent :			3. :		52. :		45. :		100. :			

Note: Board Foot Volume in Trees 9.0" D.B.H. and Larger.
Cubic Foot Volume in Trees 5.0" D.B.H. and Larger.

Table 33

Stock and Stand Table
By D.B.H. and Crown Density Classes
SPRUCE-FIR SAWTIMBER TYPE
Average Per Acre

		Stand Size and Crown Density Classes								
		Large Sawtimber			Small Sawtimber					
		Well & Medium (VS-06)			Well (VS-07)			Medium (VS-08)		
D.B.H.		Net Volume			Net Volume			Net Volume		
Classes		No.of	Scribner		No.of	Scribner		No.of	Scribner	
10"	2"	Trees	Dec. C	Cu. Ft.	Trees	Dec. C	Cu. Ft.	Trees	Dec. C	Cu. Ft.
0	1.0- 2.9									
	3.0- 4.9									
1	5.0- 6.9	50.00		202.32	27.50		98.07	62.50		208.18
	7.0- 8.9	62.50		446.21	35.00		235.72	42.50		286.68
	9.0-10.9				37.50	1,902.00	470.58	40.01	1,960.41	480.39
2	11.0-12.9	11.25	849.08	193.79	23.50	2,147.22	474.38	26.73	2,175.18	487.92
	13.0-14.9	6.25	792.00	170.49	20.25	2,711.46	574.27	17.99	2,397.65	507.43
	15.0-16.9	1.25	155.93	33.36	14.25	2,901.59	593.70	12.76	2,363.94	487.13
	17.0-18.9	3.75	696.98	145.34	8.25	2,107.95	425.49	8.58	2,153.72	436.01
	19.0-20.9	6.25	2,286.95	457.73	6.00	2,094.23	417.28	4.58	1,616.03	322.40
3	21.0-22.9	1.25	698.50	129.90	5.00	2,117.36	408.17	2.58	1,147.91	222.07
	23.0-24.9	1.25	838.20	151.63	2.50	1,319.68	247.42	1.50	891.01	164.11
	25.0-26.9	6.25	4,561.30	813.62	0.75	446.22	81.58	0.91	568.66	103.79
	27.0-28.9	1.25	530.00	101.69	1.00	876.26	153.29	0.33	259.86	46.06
	29.0-30.9	1.25	1,619.20	272.89	0.25	302.72	51.32	0.25	221.52	38.69
4	31.0-32.9	1.25	834.00	154.49				0.25	296.26	50.28
	33.0-34.9									
	35.0-36.9	1.25	2,115.19	349.99						
	37.0-38.9	1.25	983.00	180.31						
	39.0-40.9									
Total		156.25	16,960.33	3,803.76	181.75	18,926.69	4,231.27	221.47	16,052.15	3,841.14

(Table Continued)

Table 33 (Continued)

Stock and Stand Table
By D.B.H. and Crown Density Classes

SPRUCE-FIR SAWTIMBER TYPE

Average Per Acre							
: Stand Size and Crown Density Classes							
: Small Sawtimber				: Weighted			
: Poor (VS-09)				: Average			
: Net Volume				: Net Volume			
D.B.H.	No. of	Scribner		No. of	Scribner		
Classes	Trees	Dec. C	Cu. Ft.	Trees	Dec. C	Cu. Ft.	
10" : 2"							
0	: 1.0- 2.9:	:	:	:	:	:	:
	: 3.0- 4.9:	:	:	:	:	:	:
	:	:	:	:	:	:	:
1	: 5.0- 6.9:	60.26:	190.96:	60.51:	:	197.41	:
	: 7.0- 8.9:	45.51:	295.56:	43.66:	:	289.44	:
	: 9.0-10.9:	26.92:	1,209.65:	34.03:	1,620.27	401.22	:
	:	:	:	:	:	:	:
2	:11.0-12.9:	19.55:	1,429.67:	23.42:	1,839.06	414.71	:
	:13.0-14.9:	11.48:	1,334.15:	15.12:	1,928.37	409.95	:
	:15.0-16.9:	6.02:	947.44:	9.77:	1,742.13	359.86	:
	:17.0-18.9:	4.23:	993.08:	6.62:	1,631.17	330.46	:
	:19.0-20.9:	2.82:	908.15:	3.83:	1,313.42	262.22	:
	:	:	:	:	:	:	:
3	:21.0-22.9:	1.15:	437.00:	2.01:	856.14	166.19	:
	:23.0-24.9:	1.15:	573.87:	1.37:	760.94	141.05	:
	:25.0-26.9:	0.51:	337.97:	0.73:	467.21	85.02	:
	:27.0-28.9:	0.26:	191.06:	0.32:	246.56	43.74	:
	:29.0-30.9:	0.25:	219.47:	0.25:	224.68	39.23	:
	:	:	:	:	:	:	:
4	:31.0-32.9:	:	:	0.13:	156.15	26.52	:
	:33.0-34.9:	:	:	:	:	:	:
	:35.0-36.9:	:	:	:	2.75	0.45	:
	:37.0-38.9:	:	:	:	1.28	0.23	:
	:39.0-40.9:	:	:	:	:	:	:
Total	:	180.11:	8,581.51:	2,312.11:	12,790.13	3,167.70	:

Table 34

Average Volumes Per Acre
By Species, Merchantability Class and D.B.H. Class
For The

DEAD SPRUCE TYPE

Species	Cubic Feet					
	Salvable Dead			Live		
	Trees	Trees	Total	Trees	Trees	Total
	:5.0-10.9":	:11.0"+ :		:5.0-10.9":	:11.0"+ :	
	D.B.H.	D.B.H.		D.B.H.	D.B.H.	
Engelmann Spruce	: 305	: 2,356	: 2,661	: 69	: 211	: 280
Subalpine Fir	: 106	: 204	: 310	: 194	: 340	: 534
Lodgepole Pine	: 66	: 214	: 280	: 46	: 70	: 116
Aspen	: -	: -	: -	: 26	: 28	: 54
Total	: 477	: 2,774	: 3,251	: 335	: 649	: 984
Percent	:	:	: 77	:	:	: 23

Table 35

Average Net Volume
By Stand Size Classes and Species

ASPEN TYPE

Species	Sawtimber	Poletimber	Wt. Average	Percent
	Net Volume Per Acre			By
	Cu.Ft.	Cu.Ft.	Cu.Ft.	Species
Douglas-fir	21.07	41.42	41.28	8.73
Lodgepole Pine		4.31	4.28	0.90
Subalpine Fir	362.77	64.64	66.70	14.10
Engelmann Spruce		43.46	43.16	9.12
Aspen	1,337.30	310.56	317.64	67.15
Total	1,721.14	464.39	473.06	100.00
Area in Volume Stratum				
Acres	1,344	192,281	193,625	
Percent	1	99.0	100.0	

Table 36

Stock and Stand Table
By Stand Size Classes and D.B.H. Classes

ASPEN TYPE

Average Per Acre							
D.B.H.		Sawtimber Type		Poletimber Type		Weighted Average	
Classes		No. of	Net Volume:	No. of	Net Volume:	No. of	Net Volume
10"	2"	Trees	(VS-20) Cu. Ft.	Trees	(VS-21) Cu. Ft.	Trees	Cu. Ft.
0	1.0- 2.9:						
	3.0- 4.9:						
1	5.0- 6.9:	42.50	114.07	77.27	155.48	77.04	155.20
	7.0- 8.9:	32.50	189.07	23.86	122.16	23.91	122.62
	9.0-10.9:	27.50	272.92			0.19	1.88
2	11.0-12.9:	33.25	507.34	2.83	36.25	3.04	39.50
	13.0-14.9:	16.25	349.75	1.82	37.78	1.92	39.93
	15.0-16.9:	5.75	167.38	1.13	29.46	1.16	30.41
	17.0-18.9:	1.75	69.52	0.33	11.77	0.34	12.17
	19.0-20.9:	0.25	14.05	0.56	30.80	0.56	30.69
3	21.0-22.9:	0.50	20.73	0.33	17.96	0.33	17.98
	23.0-24.9:	0.25	16.31	0.11	7.46	0.11	7.52
4	33.0-34.9:			0.11	15.27	0.11	15.16
Total		160.50	1,721.14	108.35	464.39	108.71	473.06